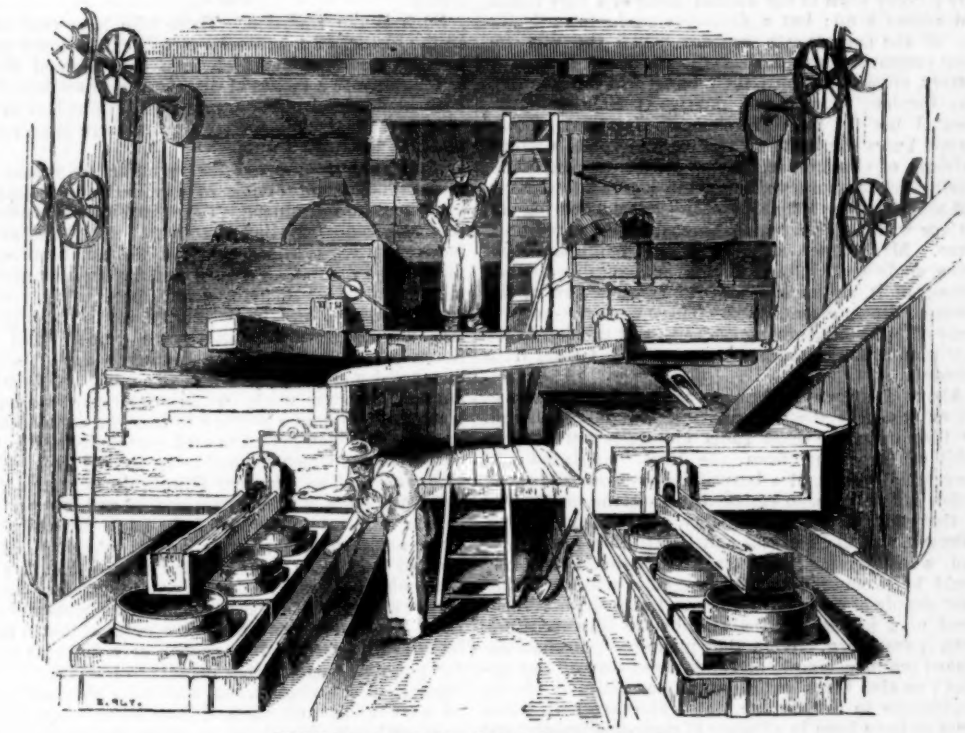
A DAY AT THE STAFFORDSHIRE POTTERIES.



[Mill-Room, where the Ingredients for Pottery are mixed.]

THERE are doubtless many readers who, when they see mention made of the "Staffordshire Potteries," marvel what these potteries mean: whether the phrase implies a number of pottery factories collected in one town, or a number of towns in one district distinguished for the prevalence of this branch of manufacture; and again, what are the reasons for the location of this department of industry in the county in question. Our present "Day's Visit" may perhaps enable us to answer both these questions.

The district known as the Staffordshire Potteries is a portion of the county about ten miles in length and two or three in breadth, lying a little eastward of the town of Newcastle-under-Lyme, and occupying an area of perhaps twenty thousand acres. It may be characterised as one long street from end to end, for the successive towns and villages are so near each other, and have gradually been so connected by rows of houses, that the eye glances from one to another with scarcely an appreciable interruption. The towns, townships, hamlets, and villages are very numerous; but the most notable are Tunstall, Burslem, Cobridge, Hanley, Shelton, Etruria, Stoke, Fenton, and Lane End; and if we pass through these towns on the high road, we shall find on either side a continued string of potteries and porcelain works, so large and so numerous that one may almost wonder where a market can be found for the immense mass of articles produced there.

This, then, is the Pottery district; and on inquiring into its history, we shall find that the busy hive of potters has been accumulated there by two circumstances —the existence in the neighbourhood of mineral products indispensable to the manufacture; and the facilities which are always afforded when many men of one trade congregate in one place. The talents and energies of a Wedgwood would have created a manufacture anywhere; but when these were brought to bear in a district already distinguished for its manufactures, the spot could not fail to become a great centre of productive industry.

There are indications that the pottery art was exercised in Staffordshire in the time of the Romans; for many specimens of earthen vessels are occasionally dug up in the district, referable to no later period of English history. Whether, or to what extent, the manufacture was there carried on in the ages subsequent to the Roman occupation, can now hardly be answered. It will suffice to say that Burslem, the "Mother of the Potteries," exhibits proof that this manufacture has been carried on there for centuries. Before the time when Dr. Plot made his survey of Staffordshire in 1686, there were here and there kilns and ovens, with rude buildings covered with thatch. The manufacture of *butter-pots* seems to have been in the seventeenth century a kind of staple product at Burslem.[1] Plot says that "the greatest pottery they have in this county is carried on at Burslem, near Newcastle-under-Lyme, where for making their several sorts of pots they have as many different sorts of clay, which they dig round about the town, all within half a mile distance, the best being found nearest the coal, and are distinguished by their colours and uses." He also tells us that at that time (1686) "the factors

buy their butter by the pot, of a long cylindrical form, made at Burslem, of a certain size, so as not to weigh above six pounds at most, and to contain at least fourteen pounds of butter."

The wares made at that time at Burslem (then the only pottery town in the district) were of a very rough and coarse kind; but a discovery made towards the end of the seventeenth century paved the way for great improvements: this was the use of salt in glazing pottery, apparently until then unused in this country. The incident is recorded thus:—At Stanley Farm, situated not far from Burslem, the servant of Mr. Joseph Yates was boiling in an earthen vessel a strong lixivium of common salt, to be used in curing pork. During her temporary absence the liquor boiled over, and some ran down the sides of the vessel, covering the surface with a liquid which on cooling appeared as a glaze. Mr. Palmer, a potter of the neighbourhood, being made acquainted with the fact, speedily availed himself of it, and established the manufacture of the common brown glazed ware. There were salt-beds in some of the neighbouring districts, and this led to the extension of the manufacture to spots still farther from Burslem.

About the year 1690 a very remarkable instance of the extension of the potteries near Burslem occurred. At that time the East India Company were in the habit of importing from the East "unglazed red porcelain" vessels, of a beautiful red colour and form, which had never been equalled in England on account of the want of the proper clay. It was discovered, however, that at Bradwell and Brownhills, near Burslem, a fine-grained and beautifully-tinted red clay could be procured; and this, together with an abundant supply of coals for the ovens, led to the establishment of a pottery at Bradwell by the Messrs. Elers, from Nuremberg. Here they made red porcelain unglazed tea-pots, simply of the fine red clay of the district; as also black or Egyptian porcelain, by adding manganese to deepen the tint. The brothers Elers seem to have been in advance of their neighbours, and to have taken extraordinary precautions to baffle curiosity. The servants employed were ignorant and stupid; and the thrower's wheel was turned by an idiot: each person was locked in the place where he was employed; and such were the precautions to preserve the supposed secret, that previous to the workpeople retiring at night, each was subjected to a rigid examination. However, all their precautions were fruitless; for two persons, named Twyford and Astbury, succeeded in worming out the secret. The former got employment at the works; and by manifesting entire carelessness and indifference to the nature of the processes, he masked his real object, which was to find out all that was new in the operations at Elers' works. Of the other man, Astbury, the account handed down is very remarkable. Having assumed the garb and appearance of an idiot, with all proper vacuity of countenance, he obtained employment at the Bradwell manufactory, and received the cuffs, kicks, and jeers of his fellow-workmen in a manner accordant with his assumed character. He was put from one occupation to another, having apparently just sense enough to make him worth the pittance which he received. Meanwhile he lost no opportunity of observing the processes and working apparatus; and on returning home each evening he formed models of the several kinds of implements, and made memoranda of the processes. He continued this practice for nearly two years, until he ascertained that no further information was likely to be obtained, when he availed himself of a fit of sickness to continue at home; and this was represented as very malignant, as a means to prevent any person visiting him. After his recovery, the Elers seemed to have a suspicion that he was too clever for them, and he was discharged: but they soon found that he had taken their secret with him; and they had the mortification to see the Burslem potters avail themselves of methods which they thought rested with themselves.

Such is the tradition. Those who have read much on the history of manufactures will call to mind many parallel instances in which men have feigned illness or stupidity as a means of discovering processes otherwise kept secret. There may be a little colour of romance thrown over the story; but there is no reason to doubt the main points.

Thus step by step did the manufacture spread, the establishments increasing in number as new kinds of ware became introduced. Topographically considered, this extension travelled southward; for Burslem, the parent pottery-town, is nearly at the northern extremity of the district. Twyford and Astbury commenced manufactories at Shelton, about three or four miles from Burslem, and there carried on the red porcelain work, and the white ware glazed with salt. Some years afterwards Mr. Astbury's name became connected with another singular adventure, by which another step was made in the progress of the manufacture. While on a journey to London, on horseback, Astbury was compelled to seek a remedy for the eyes of his horse, which seemed to be rapidly going blind. The ostler of an inn near Dunstable burned a flint-stone till quite white, pulverized it, and blew a little of the dust into the eyes of the horse, by which they were made to discharge copiously. Astbury, having noticed the white colour of the calcined flint, the ease with which it was then reduced to powder, and its clayey nature when discharged in the moisture from the horse's eyes, immediately conjectured that it might be usefully employed to render of a different colour the pottery he made. On his return home, he availed himself of his observation, and soon obtained a kind of ware exhibiting marked improvement on the pre-existing kinds. Mr. Porter remarks, that "it could have been no common mind which led Astbury to the long-continued pursuit of his object by means so humiliating; and which also enabled him, on the occasion just related, to seize upon a fact thus accidentally presented, and which, although of high importance to his art, might have passed unheeded before the eyes of many a common-place manufacturer."

We next come to the era of Mr. Josiah Wedgwood, who was to the pottery manufacture what Watt was to the steam-engine and Arkwright to cotton-spinning—its greatest improver. The pottery district of Staffordshire owes to this remarkable man a large measure of its wealth and of its commercial importance. We find various items in the history of the potteries during the early half of the last century, in which the names of Mr. Aaron Wedgwood, Mr. Thomas Wedgwood, and Mr. John Wedgwood are mentioned: these were potters, apparently in rather humble circumstances, in and near Burslem. Thomas was said to have been an excellent 'thrower' at the wheel, while John was a skilful 'fireman' in the glazing department; and both left their father, Aaron Wedgwood, to set up for themselves in Burslem. It was about a century ago when the two brothers established themselves; and they soon created a large business by the industry and sagacity with which they sought out the most improved clays and glazes for their wares.

Josiah Wedgwood, the most distinguished of the family, was the son of Thomas, and was born in Burslem, in 1730. His early education was very limited; and at the age of eleven he worked for his father as a 'thrower.' An old man, many years afterwards, used to relate that he had been engaged by Thomas Wedg-

wood to make 'balls' (as the lumps of clay are called) for the two sons, Josiah and Richard, which they, as throwers, formed into vessels, the two youths being seated in the two corners of a small room. Some years afterwards Josiah Wedgwood joined in partnership with one Harrison of Newcastle, and afterwards with a Mr. Whieldon; but he appears to have returned to Burslem about 1760, and to have there set up in business on his own individual resources. He established two manufactories at Burslem, where he made knife-handles, green tiles, imitative tortoiseshell and marble plates, white stone-pottery, and other articles. He next turned his attention to 'cream-coloured' ware, for which he had soon such a demand that he built a third factory. After a time Wedgwood opened a warehouse in London, for the management of commercial dealings, and as a depôt for articles contributory to that remarkable style of manufacture which he soon struck out. He collected vases, busts, cameos, intaglios, medallions, seals, and other works of art; and began to exercise his ingenuity in imitating them in pottery or porcelain. His imitations of Greek, Roman, and modern Italian productions were so exquisite, that he gained renown throughout Europe; and men of taste were accustomed to visit Burslem to see the operations of his establishment. The Barberini or Portland vase will always be closely connected with the name of Wedgwood, as showing what the potter's art can effect. This celebrated vase being put up to auction, Wedgwood was very desirous of buying it as a pattern from whence to manufacture copies. The Duchess of Portland "bid" for it; but Wedgwood bid against her so pertinaciously, that it attracted the Duke's attention; who, when he knew the cause of Wedgwood's solicitude, offered him the loan of the vase for an indefinite period, if it would terminate his biddings. He did so; and the vase was sold to the Duchess for nearly two thousand guineas. Such is the account given by Mr. Shaw. Wedgwood thereupon employed the finest modellers and the most talented workmen in every branch, through whose aid he produced fifty copies of the vase, which he sold for fifty guineas each: as a speculation it failed, but it raised his name to a high pitch of eminence as a tasteful manufacturer.

Meanwhile he did not neglect the more useful varieties of earthenware. He presented to Queen Charlotte some specimens of painted cream-coloured ware; which so pleased the Queen, that she ordered a complete table-service of the same kind: the pattern selected was thereafter known as the 'Queen's pattern,' and the ware as the 'Queen's ware,' while Wedgwood himself received the appointment of 'Potter to the Queen.' He next invented a much admired ware known as Jasper-ware: this was a beautiful white ware, capable of receiving rich and pure colours on any part of its surface, by which striking imitations could be produced of various kinds of ancient works of art. A kind of black ware, called Black Egyptian, was also by him applied to the making of busts and figures.

By the year 1777 a canal, the 'Grand Trunk,' had been opened for the conveyance of the pottery from the Staffordshire district to the two great northern ports of the kingdom, Liverpool and Hull. But at the time Wedgwood commenced his labours the means of conveyance were miserably insufficient. In some instances the flint used in the manufacture was carried from the mill where it was ground to the manufactories by men; in other instances, by horses, who carried tubs holding two pecks each. The chapmen, or dealers, kept gangs of horses which carried small crates; and in these crates was stowed the ware, to be carried from place to place, and exhibited to purchasers. Afterwards, when the roads became improved under the provisions of an act of parliament, carts and waggons were substituted for pack-horses; and persons travelled from place to place for orders, instead of the goods being hawked about for sale. At length the Grand Trunk Canal was boldly projected by Brindley; Wedgwood advocated it earnestly, and, as it is said, turned up the first clod of earth with his own hands, near his works at Burslem.

When the canal opened a communication between the potteries and various parts of England, Wedgwood removed from Burslem, and built a large manufactory on the banks of the canal; near which he also built an elegant house for himself, and a village of neat dwellings for his workpeople; calling the whole *Etruria*, after the ancient Italian state which produced such beautiful specimens of earthen vases, &c. Here Mr. Wedgwood continued to reside till his death; and here his descendants still carry on the business which he founded. This handing down of manufacturing establishments from father to son has been very observable in the potteries. The large works at Stoke, now the property of Messrs. Copeland and Garrett, were owned by three generations in succession of Josiah Spode's, the first of whom was contemporary with the first Josiah Wedgwood; and the other pottery towns, Burslem, Hanley, Shelton, Fenton, &c. can most of them exhibit similar examples.

Beyond this point we need not trace the history of the Potteries. The celebrity of Wedgwood and the exertions of other manufacturers, together with the gradual introduction of printed ware, porcelain, &c., raised the Potteries to a commercial rank which they have ever since maintained.

Let us see, then, what kind of a district this is, which has, *par excellence*, acquired the name of "The Potteries;" a name so distinctive, that when the parliamentary boroughs were remodelled in 1832, the franchise was given to the whole of this district as one borough, since which time there has been an "honourable member for the Potteries," although, nominally, the borough is designated by one of its towns, Stoke. Supposing a visitor to approach the Potteries by the Grand Junction Railway, and to pass through Newcastle-under-Lyme towards Stoke, he will arrive at the district about midway between its two extremities: Tunstall, Burslem, Cobridge, Hanley, and Shelton will be to the north; Fenton, Lane Delph, Lane End, and Longton will be southward; and to whichever direction he may turn, he will not be slow in observing that the towns consist mainly of small houses, in streets branching out from the high road, which runs from north to south. There are not many handsome buildings, and still fewer monuments of antiquity; but, on the other hand, there are very few indications of squalor and wretchedness. Nearly every person throughout the district lives directly or indirectly by the manufacture of pottery; and as this branch of manufacture is subject to less fluctuation than many others in the north, the instances of extreme poverty are rare. There is no living in cellars and hovels; nor is there any congregating of twenty or thirty families in one house, as some of our large towns exhibit: the houses are small and humble, it is true, but they exhibit indications of comfort which show that a large amount of wages must be distributed weekly among the seventy thousand inhabitants of the district.

Pottery is not a domestic manufacture; that is, it is not carried on in the houses of the workmen or in small shops; it is conducted in large manufactories: so that the three features which the district mainly exhibits are—the manufactories themselves, the private dwellings of the proprietors, and the streets of small houses inhabited by the workpeople. The manufactories are

distinguishable by large, lofty, dark-coloured structures, shaped somewhat midway between a sugar-loaf and a bee-hive; these are the ovens in which the ware is baked; or rather they are 'hovels' which surround the ovens, and within which the men stand to attend to the ovens. Every establishment has these 'hovels,' and the extent of the operations is in some degree indicated by the number of them. Frequently, in walking along the high road, we may see a handsome private dwelling, with 'hovels' and other buildings behind it; in such case the probability is that the house is inhabited by the proprietor of the works. If a stranger ask a question concerning these manufacturing premises, he will be told that it is "Mr. So-and-so's bank"—the pottery-works being known technically as 'banks'—why, we cannot say. "Whose premises are those yonder?" "That's Mr. Wedg'ood's bank at Trury," was the reply; for Etruria is stripped both of its beginning and its end by the workpeople.

The village just named, Etruria, is situated a little out of the main road through the potteries. It is in the road from Newcastle to Hanley, and consists almost entirely of one street, containing about a hundred and fifty houses; these were built by Mr. Josiah Wedgwood, and are occupied chiefly by persons employed in the neighbouring works. A singular uniformity is exhibited by these dwellings, both in their outward appearance and their interior arrangements. The street door opens directly into the front parlour; in fine weather the door is always open, and, in almost every case, the first object which meets the eye of a passer-by in each house is a chest of drawers, immediately opposite the door. Now, without discussing the question how far a chest of drawers is a test of respectability, it is always observable that many comforts are collected around a family which possesses this article of furniture: it shows that there are "Sunday clothes" to be taken care of, and a decent pride in their preservation. The windows too, one and all, are decked with flowers, planted in pots which would put to shame the coarse red flowerpots of a London window-sill.

There is one external mark by which the pottery operatives are to be known, all the way from Tunstall to Lane End—in the 'banks,' on the road, and at the doors of their own houses. This is the small, drab felt, close-fitting, hemispherical skull-cap, which is worn by most of the men and boys. The manufacture of these caps is largely carried on at the neighbouring town of Newcastle; and they are worn because they are cheap, and because, as it is asserted, they "keep the head warm in winter and cool in summer."

At all the various towns, there are 'banks,' or pottery manufactories, on a very large scale, as well as others of a smaller size. In some of these establishments the very finest kinds of porcelain are manufactured; in others only the common earthenware; while others again combine both classes of productions. At Lane End, besides a few establishments of the higher class, there is a very large number of minor 'banks,' where the commonest kinds of stone and yellow ware are produced, and whence the hawkers and street-dealers all over England obtain their supply. Near here too, as well as in many other parts of the Pottery district, there are coal-pits, from which is procured, for six or eight shillings per ton, an abundant supply of coal well fitted for the pottery ovens, although not equal to the South Staffordshire coal for open fires. At a little village near Tunstall all the cottagers seem to have their "coal-cellars" in the open air; for the coals are thrown down in the front of each house by the side of the door, and thence carried in as wanted.

The structures which can correctly be termed "public buildings" are but few in the Potteries. Churches, chapels, market-houses, and town-halls are the principal. In a small street in Shelton there is a neat building appropriated as a "Pottery Mechanics' Institution." It was established by a few noblemen and some of the chief potters of the district some years ago, and has a small lecture-room, a library, and class-rooms for various branches of instruction.

Such are a few of the external characteristics of the district. Let us next witness the internal, by paying a visit to one of the establishments which serve as centres of industry to this busy population. It matters little where we make our selection, for the arrangements and operations are very similar in all. But having been kindly permitted by Messrs. Copeland and Garrett to inspect their works at Stoke, we will there take up our station.

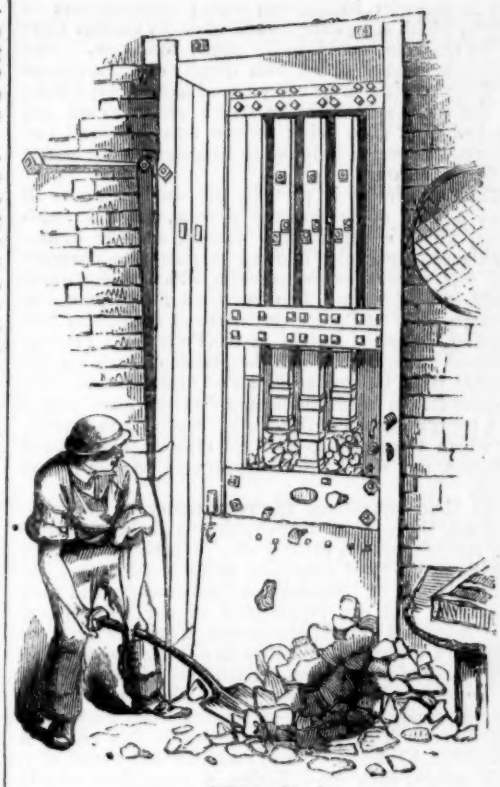
These works are, we believe, at the present day, the largest in the Pottery district: they give employment to nearly a thousand persons, and appear more like a small town than a manufactory. A very long range of windows in a brick building on the high road through Stoke, indicates the front of the works, and a gateway gives entrance to the interior. When inside the gates there is presented to the eye not one large isolated building, as in some factories—not a quadrangular area, surrounded on all four sides by buildings, as in some other cases—but a labyrinth of passages and courts, intersecting each other at all angles, and bounded by buildings. The buildings are, however, not confusedly mingled, but are divided into certain groups or compartments, according to the branch of manufacture carried on therein. One of these is the 'dish-makers' square;' that is, an open area surrounded by buildings, in which the makers of dishes work. Then there are the 'plate-square,' the 'saucer-square,' the 'coloured-body square,' the 'printer's-square,' &c., each comprising a court or area encircled by buildings. One, too, called the 'black bank,' affords an illustration of the nomenclature spoken of before; this being a 'bank,' or series of workshops, where black ware is made. Altogether there are nearly a hundred and twenty separate workshops, in which people are employed upon almost every variety of pottery and porcelain. There are in different parts of the works seven 'biscuit-ovens,' for baking the ware after it has been formed into vessels; fourteen 'glaze-ovens,' for firing the ware after the glaze has been applied to it; and sixteen kilns for enamelling and other processes. The department of the works appropriated as the porcelain manufactory surrounds a large neatly gravelled area, and is much cleaner than most other parts of the works.

When we have passed beyond the buildings where the manufacture is conducted, we come to an open piece of ground bounded by the canal. Here, scattered in huge heaps, we see the crude materials from which the porcelain and pottery are to be made. The *chert*, for the floor of the grinding-mills; the *gypsum*, or *sulphate of lime*, to make plaster moulds for casting; the *flints* from Gravesend and Northfleet, as one material for pottery; the Staffordshire *marl*, for forming the seggars, or fire-cases; the Devon, and Dorset, and Cornwall *clays* and *stones*, employed in the manufacture; and the *coals* with which the ovens and kilns are to be heated. All these are brought to the works by the canal, which is connected with other canals leading to Liverpool, to which port all the mineral products from Devon, Dorset, Cornwall, and Kent are brought in the first instance, and thence sent by barges to the Potteries. It is a curious circumstance that at the present day the Staffordshire clay is not employed for any of the pottery: it has been entirely superseded by the clays of other districts, and is now only used to

make the seggars: it is a kind of marl found interstratified with the coal, and is easily procured. These works are supplied with coal from collieries belonging to the same proprietors at Fenton, a short distance from Stoke; but independent of these collieries, the works at Stoke occupy an area of ten or twelve acres.

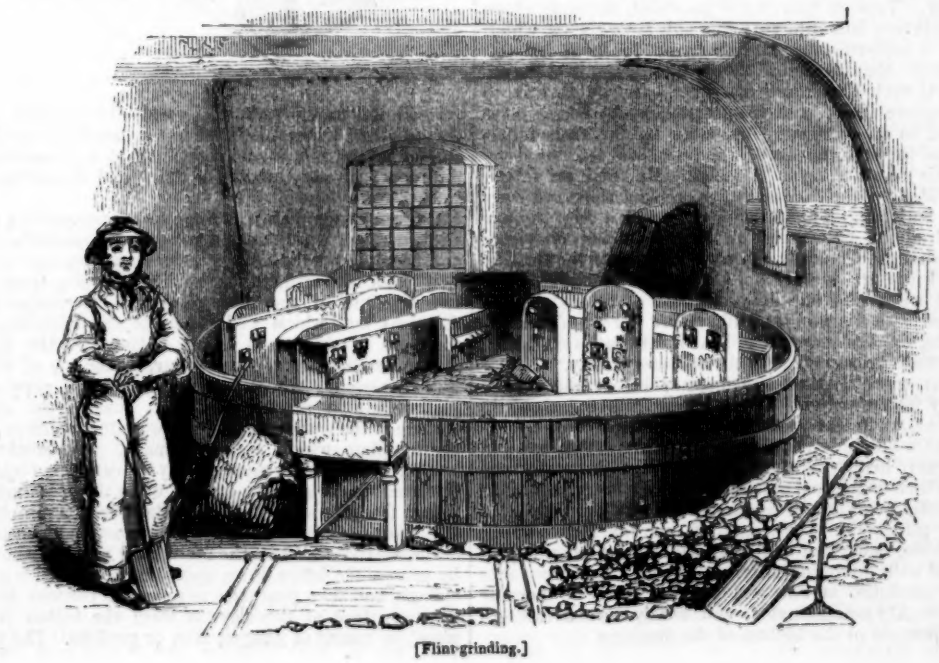
The operations carried on within the various buildings whose arrangement we have described comprise the whole series incidental to the manufacture of pottery and porcelain, from the calcining and grinding of the flint, to the printing, the enamelling, the gilding, &c. There are in various parts of the Pottery district 'flint-mills,' situated generally where there is water-power, and employed solely for grinding the flint required by the smaller manufacturers. But at these works all the flint is calcined in a kiln and ground in a mill within the establishment. In noticing these arrangements we shall be able, by referring to our recent Supplement on the Porcelain Manufacture at Worcester, to confine ourselves mainly to matters not treated there; so that the two papers together will give a tolerably complete view of the manufacture.

Flint and a few kinds of clay form the main ingredients of all the numerous varieties of pottery and porcelain, and are made fit for the potter's use by nearly the following processes:—The flints, brought from Gravesend in irregularly shaped pieces, are placed in a kiln, shaped somewhat like a lime-kiln, where they are stratified with layers of small-coal. Heat is applied, and the flints are burned or calcined to a white colour, in which state they are more easily broken than before. These pieces are then pounded to still smaller fragments by the 'stampers' represented in the annexed cut, and which act in a curious manner. These stampers are perpendicular pieces of wood loaded with iron, and fall upon or into a box, whose bottom consists of a strong iron grating: they are raised alternately by machinery connected with a steam-engine, and made to fall heavily upon the pieces of calcined flint, which become thereby broken small enough to fall through the iron grating. The flinty



[Flint-crushing.]

fragments are then ground to a perfectly fine state in the large vat or vessel here represented, designated the mill. It is a circular vessel, twelve or fourteen



[Flint-grinding.]

feet in diameter, having four arms extending from its centre, which arms carry round what, in another form of the machine, would be the upper millstone. The bottom is lined or paved with Welsh 'chert,' a species of flint; and the arms carry round large heavy blocks of the same substance, by which the calcined and crushed flint, after being thrown into the vessel and covered with water, is found to be a consistence nearly as fine as cream.

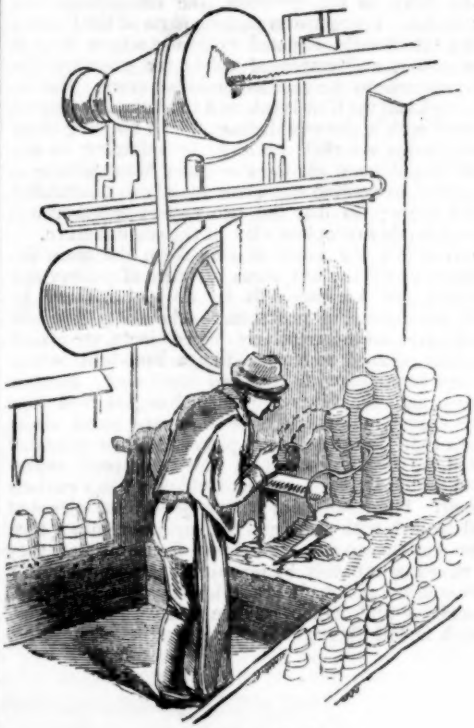
The Cornish clay is partially prepared in Cornwall from a kind of decomposed granite, called Cornish stone, which is ground and washed, and the lighter argillaceous particles allowed to flow into channels and pits, where a sediment forms, which is afterwards made into cakes, and then barrelled for shipment to Liverpool. The Dorset clay receives hardly any preparation before it arrives at the Potteries. The sulphate of lime, from which the plaster of Paris for the moulds is to be produced, is first broken small, then ground fine in a mill similar to a flour-mill, and placed in a trough formed of fire-brick: heat is then applied, by which the sulphate loses its crystalline form, and assumes the well-known appearance of plaster of Paris.

All these operations are preparatory to the 'slip-making,' the process whereby the clay is brought into the state fit for the potter's use. Whether clay be for the finer kinds of porcelain or for earthenware, the arrangements for 'slip-making' are analogous in their character, and are represented in our frontispiece. The materials travel downwards, from one level or stage to a lower one, and then to a lower one again, in the course of preparation. Each kind of clay and flint is beaten up, in a distinct vessel, with water, into a sort of cream, by means of rotating arms worked by machinery. The proper thickness of this cream is estimated by the number of ounces which a pint of it will weigh, each kind having a recognised weight known by experience to be best fitted for the object in view. These different creams then flow into large tanks, and from thence along troughs into other tanks, where they are mixed together; gauge-marks being used to afford a guide as to the quantities mixed together. Taps or valves are provided, through which the mixture falls into very fine silk lawn sieves, which have a reciprocating motion given to them by machinery: the fineness of this lawn (for the best porcelain) is such that there are three hundred threads to the square inch; and the cream thereby becomes reduced to an extremely fine state by the time it has passed through the sieves.

This mixture, then, is called 'slip,' and we follow this slip to the 'slip-kiln,' a remarkable and very long building. This place consists of a low room a hundred and twenty feet in length, having on either side shallow slip-kilns and a passage down the middle. The kilns are merely open troughs, sixty feet long, eight wide, and one deep, formed of fire-brick, and heated with flues underneath. Here the 'slip,' or clay-cream, remains exposed to heat for twenty-four hours, by which it evaporates to the stiffness of clay.

One more process is necessary before the clay is ready for the potter. When taken from the slip-kiln it is not sufficiently smooth and homogeneous, but requires a kind of annealing or kneading. This used, in the early history of the manufacture, to be performed by laborious manual operation; but a very ingenious and effective kind of apparatus is now employed for this purpose. It consists of an inverted conical machine, down the centre of which runs an axis provided with knives or cutters. The clay, being put into this machine, is cut and pressed so as to become thoroughly amalgamated, and finally forced through an aperture in the bottom of the machine.

The clay, being thus prepared, is transferred to the 'plate-maker's square,' the 'dish-maker's square,' the 'throwing-room,' or to any of the numerous workshops where the potters are employed. How the general process of 'throwing' is effected, by which the greater number of earthenware vessels are made, we gave an illustrated description in the former paper, and also of the mode in which the 'handle-maker' proceeds. We may therefore pass over these operations here, and notice one or two others. The 'turner,' it will be seen from the annexed cut, works at a lathe in a manner



[Pottery-turning.]

very similar to the turner in wood: the 'thrown' and partially-dried vessel is fixed to the chuck of the lathe, and by means of iron and steel tools of various shapes, the turner gives symmetry of form and smoothness of surface to the vessel.

Plate-making, dish-making, and saucer-making constitute very large departments of the manufacture, and in such works as are now engaging our attention each department is wholly distinct from the others. One of the plate-makers is represented in the next cut, which will illustrate the following description of making a plate:—Beneath the workman's hands is a vertical pillar, on the top of which is a horizontal wheel bearing a reverse copy of a plate made in plaster of Paris; that is, the upper surface is the same size and shape as the inside or face of the plate which is to be made. The workman, having beaten out a piece of clay to nearly the required thickness and diameter, lays it upon the plate-mould, places this mould on the horizontal wheel, and bids his attendant (a lad) set it into rotatory motion by means of a winch-handle. While the mould and clay are rotating, he presses the latter down upon the former with a wet sponge, and then proceeds to give the contour to the upper surface of the clay (to form the *bottom* of the plate) by means of gauges, ribs, or profiles. The plate

[Plate-making.]

is thus formed in a very short time; the plaster mould giving the one surface and the gauge the other.

Dishes, saucers, and all flat vessels of which one side is scarcely seen, are made in a similar manner, the least important side, generally the bottom, being formed by means of the gauges or patterns, while the surface which is to be visible is shaped by means of the plaster-mould. The plates, &c. are not removed from their respective moulds directly they are made; they are put into drying-stoves, mould and all; then taken out and trimmed smooth by passing the profile-gauges again over them; again stoved, and then separated by the contraction of the clay. But when both surfaces of a flat vessel, such as in the more ornamental kinds of porcelain, are to be visible, the vessel is generally moulded on both sides by a more complicated process. The room where some of these articles are dried is no less than a hundred and forty feet in length, and is known technically as the 'green-house,' or the place where the ware is placed when in the 'green' state.

How the ware is brought from the 'green' state to the 'biscuit' state, was sufficiently explained in the former paper, and renders any detailed description unnecessary here. The manufactured vessels, whether thrown at the wheel, or pressed, or cast in moulds—whether of earthenware or of porcelain, are placed in seggars, or fire-cases, as a means of protection from smoke, and these seggars are placed in the biscuit-ovens which are so numerous at these works. Four hundred tons of coal per week are required to heat these ovens and the other parts of the working apparatus.

The 'biscuit-warehouse,' in which all the ware is temporarily deposited after being 'fired' in the ovens, is very striking to a stranger, from its large size, and the enormous piles of ware always lying there. To give an idea of the appearance, we will describe one group which came under our notice. Whoever has been to Woolwich Arsenal must have seen the piles of cannon-balls lying in symmetrical array, all pyramidically arranged. Imagine then, plain white basins instead of cannon-balls, each one lying in the hollow of another to make the mass solid and compact; and further imagine *four thousand dozens* of similar vessels all thus arranged into a pyramid: this will give an idea of one of the singular heaps in the room. The stock in this room or warehouse is constantly undergoing change; for as one portion is removed to undergo the finishing processes, another portion is brought from the ovens to be warehoused.

The manner in which earthenware is commonly decorated is strikingly different from that adopted with respect to porcelain. The decorations in porcelain, as was pretty fully explained in the former paper, are produced by painting, with camel-hair pencils, various devices on the porcelain, the paint or pigment being formed of mineral colours, which are afterwards made to adhere permanently to the porcelain by the heat of the annealing-kiln. In pottery, however, a cheaper and more expeditious mode is adopted. One kind is called gold or silver *lustre-ware*. To produce the metallic lustre on the surface of this ware, certain metallic oxides are mixed up with essential oils to the consistence of a paint, and then applied with a brush over the surface of the vessel: the heat of a kiln afterwards dissipates some of the component ingredients, and leaves the metallic lustre visible; but the metals employed are merely substitutes for gold and silver, not the costly metals themselves.

Another variety, called 'dipped-ware,' receives its decorations in a manner so remarkable as to form one of the most curious operations of a pottery. It is a cheap kind of ware which is thus ornamented, and may be known by the fanciful but rather indefinite devices on the surface, in three or four different colours; the device being raised somewhat above the general level of the surface, but similar to it in texture. After the vessel has been turned it is fixed to a wheel, which is made to rotate while the workman effects the operation. We will suppose that the vessel is to have a device in three colours, brown, yellow, and blue: in such case the workman prepares three kinds of clay, coloured to the proper tint, and brought to the consistence of paste or cream by admixture with water. A portion of these three he puts into a kind of funnel having three compartments, so that all three remain separate, and yet flow out of three adjoining apertures at the bottom simultaneously. This funnel the workman holds over the vessel while revolving, in such a manner that a little stream of tri-coloured paint shall drop upon it, and form bands, stripes, spots, curves, or spirals, according to the manner in which the funnel is held and the velocity with which the vessel rotates. The three colours are contiguous, and flow in a united stream from the funnel; yet they are perfectly distinct in their position in the vessel. The vessel, it will be understood, is on its side, and rotating on a horizontal axis. The quickness with which this process is effected is quite astonishing, and the whole affair demands singular dexterity in the workman.

Perhaps in the whole range of the pottery manufacture, there is no kind of decorative operation which has been more generally approved, or which has tended more to give neatness to the appearance of the manufactured articles, than that of 'blue-printing,' or the transference to the ware of a device previously printed on a piece of paper from an engraved copper-plate. Before the introduction of this kind of ware there were two kinds, called 'blue-painted' and 'black-printed' wares: the former having merely a small border or edging round each vessel, painted in blue colour with a pencil; and the latter having a device

transferred to the glazed ware by a kind of printing. But both were in time superseded by the method of 'blue-printing.'

The arrangements for 'blue-printing' are simply as follow:—The designer in the first place draws a design, corresponding in size to the size of the vessel to be printed. In the early stage of the system no fine lines were introduced into the design; but coarse unmeaning patterns, such as the 'willow' pattern, were alone employed. By degrees, however, a better taste prevailed, and landscapes and other pleasing subjects were introduced. The design, when finished, is given to an engraver, who engraves it on a flat copper-plate in the usual manner. From the plate so engraved impressions are taken upon a peculiar kind of thin paper, made expressly for this purpose by Messrs. Fourdrinier, who have a paper-mill in the immediate vicinity of the Potteries. The colour, for the impression, is a mixture of certain metallic oxides with oil, and is brought to the thickness of a cream. The engraved plate is placed upon a flat stove; and, when heated, the printer rubs the ink well into the device, as seen in the annexed cut. With a knife he then

[Printing Blue-ware.]

scrapes off the superfluous ink from the surface, and rubs the plate quite clean, leaving ink only in the engraved device. Meanwhile the paper has been moistened in soap and water; and an impression is then taken by means of a small roller-press.

Immediately that the printed paper is ready, it is handed to a woman called a 'transferrer,' who, in the manner here sketched, lays it down upon the plate or other earthenware vessel which is to be printed. Sometimes it can be put on in one piece; while at other times it is cut into a few pieces by another female, and then adapted to the various curvatures of the vessel. The transferrer next takes a kind of rubber, formed of a roll of flannel wrapped round the end of a stick, and rubs the paper very forcibly down upon the vessel, the coloured surface being next to the vessel;

[Transferring the Print.]

this rubbing is so violent, that if the paper were not of a tough quality (though thin), it would be worn into holes. The ware, being in the porous 'biscuit' or unglazed state, imbibes the colour from the paper. The vessel is immediately handed to another female, who immerses it in cold water, and washes off all the paper from the surface. It is then seen that the ware has imbibed the colour so intimately that the washing away of the paper has not removed it from the ware: the device is perfectly transferred. The ware is placed in a kiln, to drive off the oil from the ink; and the printed vessel is then ready for the process of glazing. Thus is effected the decoration of a kind of ware, the introduction of which, to use the words of Mr. Porter ('Treatise on Porcelain'), "has added materially to the decent comforts of the middle classes in England, and has more than any other circumstance contributed to the great extension of our trade in earthenware with the continent of Europe."

At the Works which have been engaging our attention the most costly kinds of porcelain are largely manufactured, as well as the commoner but more generally used kinds of earthenware; and the splendid show-rooms belonging to the establishment richly illustrate the state of excellence to which this branch of manufacture has arrived. But the Supplement (No. 700) to which reference has before been made will render it unnecessary here to detail the train of processes involved in the manufacture of porcelain. Suffice it to say that porcelain constitutes a notable branch of the operations conducted in the Staffordshire Potteries: operations by which the manufacturing reputation of England has been greatly heightened; by which sixty or seventy thousand persons earn their daily food; and by which a busy district has been peopled—not only to the extent which warranted the parliamentary franchise given to them—but with a class of persons as favourably circumstanced, perhaps, in a social point of view, as any body of manufacturing operatives in the country.